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AUTHOR Carroll, Rebecca E.; Cook, J. Marvin
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ABSTRACT

A research project conducted during the 1976-77 academic year in the Baltimore City Public Schools is investigating the effect providing staff development to teachers on how to teach with learning hierarchies will have on students' achievement scores and rate of learning. Twenty teachers participating in the study are taking a year-long course on learning hierarchies; half of them are also receiving inservice instruction on teaching with learning hierarchies. The effects on rate of learning and achievement scores are being measured with proficiency tests administered to the students of the teachers in both treatment groups. Early results indicate that the combination of the course plus inservice instruction is more effective than the course alone. (MLF)

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AN EXPERIMENT

IN THE

APPLICATION OF LEARNING HIERARCHIES

TO CURRICULUM CHANGE

IN A LARGE URBAN SCHOOL SYSTEM

by

Rebecca E. Carroll
Deputy Superintendent
Bureau of Education
Baltimore City Public Schools
Baltimore, Maryland

J. Marvin Cook
Associate Professor of Education
Division of Education
University of Maryland, Baltimore County
Baltimore, Maryland

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There is current need for newness in education. Everyone in public education, especially in the large cities, realizes this. In an Association for Supervision and Curriculum Development publication, Alexander Frazier writes, "All of us, out of our own personal and professional experience in recent years, have derived a new sense of concern that ought to govern our interaction with children."[7] This sense of concern for educators should be a more effective use of human resources so that learning in the school is maximal, satisfying, and rewarding for each student.

The criticism concerning obsolescence in education and poor student achievement in many curriculum areas is still permeating American ideology. Educators of large school systems realize that their educational effectiveness and accountability have direct relationships to the viability of the large cities of which they are a part. School Boards, Superintendents, Educational Staffs, and Community are awake and sensitive to the need for concerted effort and collaboration. But the focus of improvement and change still lies in the classroom. The key or fundamental emphasis is better student achievement.

The System Emphasis

The Baltimore City Public School System has for another consecutive year emphasized the use of learning hierarchies as a curriculum effort to enhance student achievement. Despite a stringent budget which led to a cut-back in support staff, the momentum concerning the use of hierarchies has been kept moving. The systemwide emphasis has not been on hierarchies per se, but on classroom methods to enhance student achievement. In staff development activities, in total staff television programs, and in whatever the specific learning experience planned for teachers at the regional and school level, emphasis has been placed on:

. involvement of the student in learning

. creation of opportunities for student interaction through grouping or individualized instruction

. use of measureable teaching objectives

. determination of student growth increments in a specific lesson

. prescriptive teaching following an analysis of student achievement

The use of learning hierarchies inculcates the listed emphases. In fact, through careful planning of hierarchies in curriculum and through directed student use of them in the classroom learning of students seems more meaningful and facilitated.

Expected Benefits

A definite indication of benefits derived from staff focus on the use of learning hierarchies was given in the paper by Carroll and Cook, "Application of Learning Hierarchies to Curriculum Change in a Large Urban School System" and presented at the annual meeting of the American

Educational Research Association, San Francisco, California, April, 1976.

The following is an excerpt:

> The effort to implement the use of learning hierarchies in the Baltimore City School System was based upon the expectations gained from a review of the research on behavioral objectives and learning hierarchies and from the application of learning hierarchies in local settings. Although surveys of the research by Briggs[1], Walbesser and Eisenberg[9], and White[11], and more recently Walbesser[10] do not yield conclusive results, they have raised for Baltimore City the expectation that learning hierarchies will be an educational tool that will help to increase the success patterns of urban students.
>
> While the findings from the research indicate that the benefits to be gained from the use of behavioral objectives and learning hierarchies need to be studied further, the findings were sufficient for Baltimore City to expect that the following benefits might be gained by the student:
>
> 1) increased rate of learning
> 2) increased resistance to forgetting
> 3) increased motivation.
>
> A study recently completed by Cook and Sacco[5] suggests that teachers' attitudes toward accountability issues are moved toward the positive end of the scale when they have acquired the competence to teach with learning hierarchies. The findings by Cook and Sacco lend support to Baltimore City's expectations that by providing in-service training to its teachers in procedures for teaching with learning hierarchies, the school district can expect its teachers to be more cooperative and more open to the move toward accountability for student growth.

A System-wide Inventory

The problems of large city school systems seem to be somewhat the same all over the nation. Education makes progress that is not always continuous. In this regard, the Baltimore City School System's total use of hierarchies has received some setbacks. Disuse of learning hierarchies in some schools was the result of:

- change in curriculum leadership in a school
- lack of a clear statement of purpose and diminishing intensity on the mandate for each school to emphasize specific techniques for learning
- lack of "follow through" or "follow up" to the staff development programs which stressed the use of hierarchies (This "follow up" is the responsibility of regional instructional teams as well as the central curriculum division.)

The system, from a curriculum standpoint, is still asking such questions as:

- What is the role of the School Board in articulating a clear and definite educational policy for which each school, each class, each teacher, and each student will be held accountable?
- How can unity of purpose in a large school system survive despite great personal and professional variability?
- How can teachers be helped to develop their own positive motivation for high expectations regarding achievement for each student?
- What is the most expeditious strategy in preserving and disseminating the use of learning hierarchies in the classroom of a large school system?

Background for the Experiment

Mention has already been made about the plight of students in large urban centers not achieving at the desired levels. In an effort to provide focus to the educational process so that students will graduate from high school with a critical minimum of competencies, many large educational systems are moving toward competency-based education. Such education involves stated behavioral objectives in every classroom as a basic requirement. Teaching in a systematic manner is a requisite for student achievement. The Baltimore City Public Schools are therefore making an effort to approach teaching in a systematic manner focusing on achievement, but with the use of learning hierarchies as an enabling factor.

Educators like Walbesser, Gagne, White, Cook, Carter, Raths, Kurtz, Hastings, and others, have found evidence to suggest that teaching with stated behavioral objectives in a hierarchical sequence is beneficial to student learning. Cook (1969)[2], found that when students are informed of the behavioral objectives and their place in the learning hierarchy, the students' retention of the learned competencies is significantly greater than when students are not so informed. In 1972 Cook[3] also found that providing teachers with behavioral objectives and/or the learning hierarchy for a unit of instruction without providing staff development for the teachers on how to teach with behavioral objectives and learning hierarchies did not result in increased learning by students.

Cook and Sacco found in their study published in 1976[4] that teachers who received staff development in how to teach with learning hierarchies had a more positive attitude toward accountability than teachers who did not receive such staff development.

Teachers have often expressed the strong desire for additional staff development that will help them help their students. Yet this expressed strong wish to receive effective staff development comes at the time of an economical recession that makes it imperative that the staff development that is provided to teachers is able to make a significant difference in student achievement. It is in the context of these four points: (1) need for student achievement, (2) need for staff development that makes a difference in student achievement, (3) the existence of a natural economical slow down, and (4) past research on learning hierarchies, that

the following questions were raised by the authors of this paper in conjunction with Drs. Wilmer Jones, Coordinator of Mathematics, and Edward Whitney, Staff Director, Office of Pupil and Program Monitoring and Appraisal of the Baltimore City Public Schools.

Q_1 -- What effect will providing staff development to teachers on how to teach with learning hierarchies have upon the students' achievement scores?

Q_2 -- What effect will providing staff development to teachers on how to teach with learning hierarchies have upon the students' rate of learning?

An eight-months research project was begun in October of this academic year (1976-77) to study these two questions. The final data of this study will be obtained in May, 1977.

Research Hypotheses

This study, presently in progress, is focused upon the effects of the following two treatments on achievement scores and rate of learning of the students of the teachers participating in the study:

Treatment H: Teachers received the objectives of a year-long course and in-service instruction on teaching with learning hierarchies.

Treatment C: Teachers receive the objectives of a year-long course but not receive in-service instruction on teaching with learning hierarchies.

The effects on rate of learning and achievement scores are being measured with proficiency tests administered to the students of the teachers in both treatments. Null hypotheses related to the following research hypotheses are to be tested by this experiment:

Research Hypothesis 1: Students of teachers receiving in-service instruction on teaching with learning hierarchies attain higher achievement scores than those students whose teachers do not receive such in-service instruction.

Research Hypothesis 2: Students of teachers receiving in-service instruction on teaching with learning hierarchies have higher rate of learning than those students whose teachers do not receive such in-service instruction.

Procedure

Utilizing the proficiency mathematics tests administered to all eighth grade students in Baltimore City Schools in October, 1976, twenty (20) classes were randomly selected from the eighth grade classes which had class average scores within the range of 13 to 15. The mean of eighth grade class average scores was 14.3. These classes were then randomly assigned to one of the two treatment groups. The teachers of these randomly assigned classes were then asked if they were willing to participate in the experiment. All teachers asked responded positively.

On December 8, 1976, the ten (10) teachers in Treatment H received six (6) hours of instruction on teaching with learning hierarchies. The instruction was based upon two texts: The Successful Teacher - A Systematic Approach, by J. Marvin Cook, and How To Meet Accountability with Behavioral Objectives and Learning Hierarchies, by Cook and Walbesser.[6] The teachers received instruction in task analysis, developing learning hierarchies, and teaching strategies.

During the following week, the teachers taught one of their mathematics sections using the hierarchy approach they had learned. On December 15, the teachers received another six (6) hours of in-service instruction buildingon the experiences they had during the week. One-hour follow-up

sessions are now being held each month with the teachers in Treatment H from January through April, 1977. All teachers in Treatment H and Treatment C have received copies of the list of Reasonable Expectancies (Objectives) for Eighth Grade Mathematics.

Base line data was obtained on January 13, 1977, by administering a math proficiency test equivalent to the proficiency test administered to all eighth grade students in the school system in October, 1976. The January 13 test will serve as a pre-test for the experiment. (Initial plans to administer the pre-test on December 20, 1976, did not materialize.) On May 3, 1977, a proficiency test will be administered to all eighth grade students in the school system. This proficiency test, equivalent to the October test, will serve as the post-test for this experiment. In addition, three equivalent versions of the proficiency test are being administered at four week intervals between January and May.

Experimental Design

Two statistical designs, analysis of variance and repeated measures analysis will be used to analyze the data in this study. The analysis of variance will be utilized to determine whether the data supports the research hypothesis regarding achievement scores. The repeated measures analysis will be used to determine the existence of interaction between the treatments and the tests over time. If there exists a significant treatment-by-tests interaction, the pre-test and post-test scores will be plotted to determine by the slopes of the curves which treatment in the experiment resulted in a higher rate of learning. The scores obtained from the three

intermediate tests administered after January and before May will be plotted to determine when between January and May the change in rate of learning became most pronounced.

Early Findings

At the time of the preparation of this paper some early data has been collected and analyzed graphically. As illustrated in Figure 1, the slope of the rate of learning curve of Treatment H rises sharply from the January test date. The slope of the rate of learning curve of Treatment C as shown with the scale utilized in Figure 1 appears to follow the same trend that existed between October and January. The mean scores as obtained in January and February for both treatments are shown in Figure 2. The authors of this paper expect to have additional data at the time we present the paper in New York.

Teachers' Reaction

The reaction of the teachers who are receiving the staff development has been extremely positive. The authors hope to share a portion of an audio tape on which the teachers have expressed their reaction to what is happening in their classrooms as a result of their having received the staff development in teaching with learning hierarchies.

Conclusions

It is obviously tooearly to have any conclusions to this study. The authors are however encouraged by the existing data. Earlier research and the cumulative learning characteristic of the learning hierarchy teaching/learning process suggested that a difference in rate of learning would not occur until March or April. The trend established by the January-February data suggests that the staff development in learning hierarchies may indeed have the desired effect on student achievement.

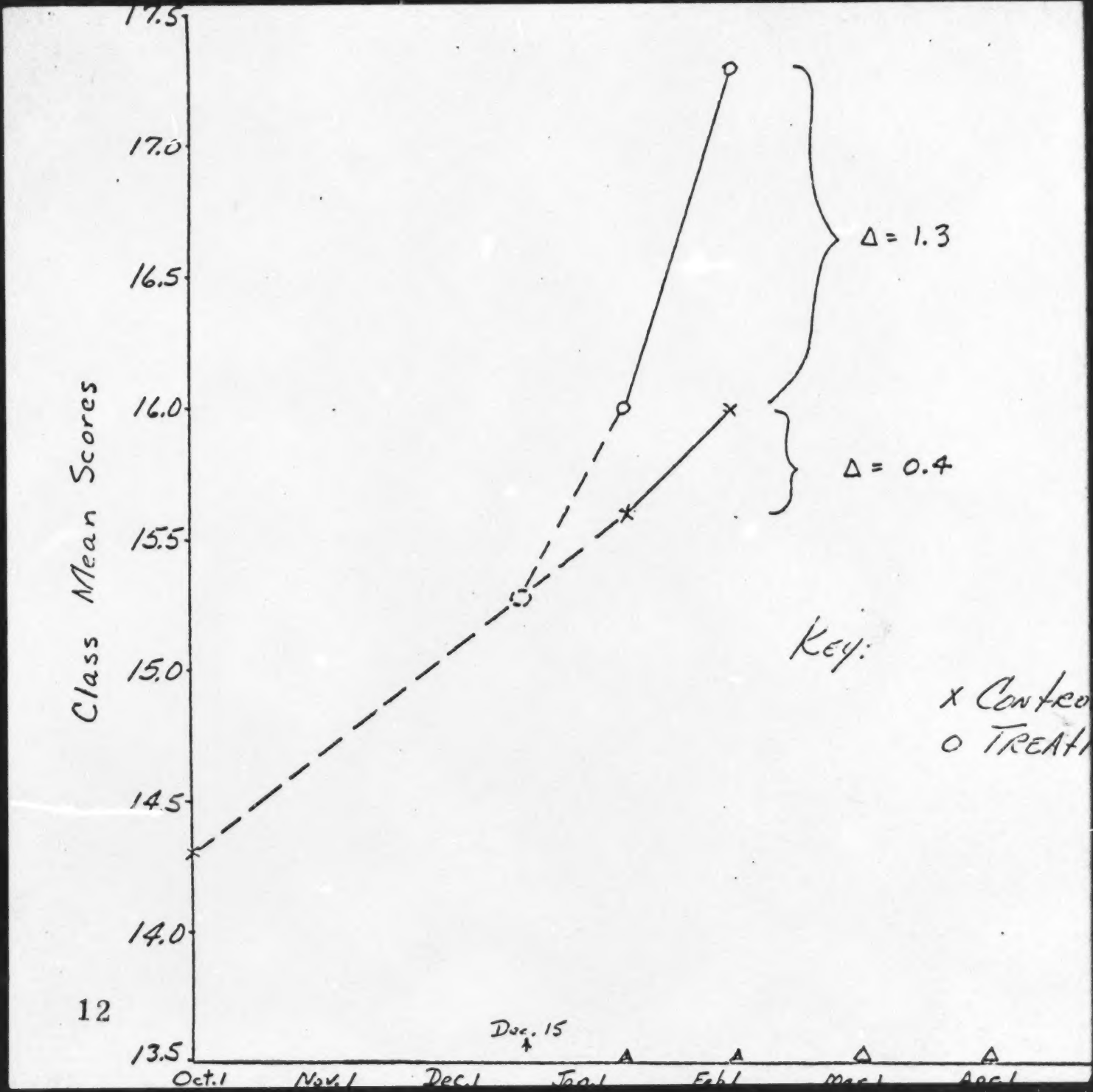
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
13.5
Class Mean Scores
Δ = 1.3
Δ = 0.4
Key:
x Control
o Treat
Dec. 15
Oct. 1
Nov. 1
Dec. 1
Jan. 1
Feb. 1
Mar. 1
Apr. 1

FIGURE 2

MEANS OF JANUARY AND

FEBRUARY SCORES

Treatments	Teachers	Class Means	
		Jan.	Feb.
T_C	T_1	17.2	15.4
	T_2	13.8	14.4
	T_3	16.7	12.9
	T_4	15.5	17.3
	T_5	15.1	16.4
	T_6	12.4	13.2
	T_7	14.5	16.8
	T_8	18.4	17.8
	T_9	17.8	17.7
	T_{10}	13.8	16.9
T_H	T_{11}	16.2	19.2
	T_{12}	15.4	17.4
	T_{13}	17.0	20.4
	T_{14}	16.4	16.2
	T_{15}	15.3	14.3
	T_{16}	15.8	16.8
	T_{17}	13.4	13.6
	T_{18}	16.4	16.6
	T_{19}	14.8	17.9
	T_{20}	18.3	20.2

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